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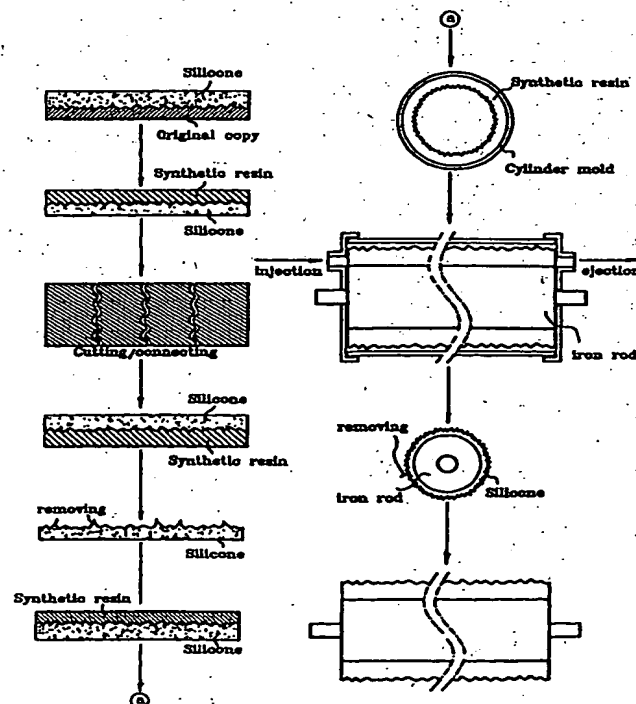
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## (57) Abstract

This invention is about the method and equipment of manufacturing the embossed roller. You can get an embossed roller without connecting marks by checking beforehand the state of the pattern and surface, the roller will be of fine pattern quality. Through the making of a master roll you can produce several embossed rollers, and if the embossed roller wear out you can produce another roller immediately creating a basis for uniform quality and mass production.



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## METHOD AND DEVICE FOR MANUFACTURING AN AMBOSSING ROLLER

### TECHNICAL FIELD

5       The present invention relates to a method of manufacturing an ambossing roller used to continuously apply the ambossing process on the surface of various goods such as artificial leather or thermoplastic resin, and more particularly to a method for manufacturing an ambossing roller by a master roller through which  
10 it is possible to manufacture many same pattered ambossing rollers at the same time reducing the manufacturing process of the ambossing roller.

### BACKGROUND ART

15       Generally, to artificially reproduce the surface pattern of a natural leather etc., the original pattern is engraved into plastic boards or steel plates which are then pressed onto the product whereby reproducing the pattern of the original onto the surface.

20       There are many such methods in use right now and various ambossing rollers manufactured this way are now in use.

25       However in the previously explained method of manufacturing ambossing rollers the manufacturing process was demanding and hard, there was also the problem that the surface of the manufactured roller was not fine enough to make a roller of high quality.

      For example see the ambossing roller manufacturing method presented in patent number 82-2341 of the Republic of Korea.

30       According to the above technology the method of manufacturing ambossing rollers is as follows. First you must apply silicone onto the surface of the original copy and produce a silicone sheet of the engravings. Then take these silicone sheets and continuously attach them to the inside of the cylinder. Then insert

another cylinder , the distance between the silicone sheet and the new cylinder should equal 5mm. Then insert a mixture of epoxy grease and plasticity chemical between the silicone sheet and the cylinder and let it harden. After the above mixture is hardened and  
5 the outer cylinder and silicone sheet is removed you will obtain a embossed carving epoxy resin roller on the outer surface of the inner cylinder. On the surface of the roller there will be traces of the connecting places of the silicone sheets, this must be removed.

Put this roller again into a outer cylinder and inject silicone .  
10 When the silicone is hardened and the silicone is removed from the epoxy resin roller you will obtain a engraved silicone tube.

And then the silicone tube is put into a cylinder and then a roller is inserted , an adhesive agent is injected between the tube and the roller and is let to harden. This produces the embossing roller  
15 whereby the silicone tube is attached to the outer surface of the roller.

In an embossing roller produced by this method the surface of the original pattern is successively reproduced and since the connecting marks do not remain the pattern of the original copy can  
20 be reproduced onto the product.

However, the above method was developed mainly so that the surface of the embossing roller would have the same engraved pattern as the original copy without any connecting marks.

Therefore even if the patterns are from the same original copy  
25 ,the deterioration of successive copies is a weakness that can not be overcome. Also the former method for producing silicone embossing rollers can produce only one at a time, therefore if the roller is no longer useable ( since the characteristic of silicone is that it wears fast ,after using the ambossing roller for 100,000km the surface  
30 wears out and is no longer useable) one must go through the inconvenience of repeating the above production method to obtain another silicone ambossing roller.

And in the process of reproducing, the pattern may be different from the initial pattern which would create the problem of not being able to satisfy the needs of the orderer in the case of a large order( 300-400thousand meters).

5

### SUMMARY OF THE INVENTION

Therefore, it is an object of the present invention to provide a method of manufacturing an ambossing roller that is produced by checking the shape of the pattern and the surface state before  
10 producing the ambossing roller so that it can be corrected to produce a fine pattern roller without any connecting marks.

And through the production of a master roller, the same several silicone ambossing rollers can be made, and in the case of wear a ambossing roller can be made immediately from the master  
15 roller allowing for uniform products to be produced in mass quantities. This is the goal of this production method.

The term "ambossing roller" used here means a cylinder in the form of a roller that has a engraved silicone applied and hardened to its surface.

20 The term "silicone tube" used here means a silicone sheet curved into a and its hems attached together to form a tube ,whereby depending on the way the tube is curved the pattern on the surface of the silicone will form on the inner or outer side of the tube.

The term "synthetic resin" used here means the same as the  
25 above silicone tube but the material of which is synthetic resin.

The term "master roll" used here means the mother roller with engravings used to produce the embossed carving ambossing roller.

### BRIEF DESCRIPTION OF THE DRAWINGS

30 The above objects and other advantages of the present invention will become more apparent by describing in detail preferred embodiments there of with reference to the attached drawings in

which:

Figure 1 illustrates the production of the ambossing roller according to this invention in a flow Figure.

Figure 2 is a approximate structural Figure of the production equipments used to make the master roller that is used to make the ambossing roller according to this invention.

Figure 3 is an approximate Figure of the silicone adhesive material attached to the surface of the iron rod of the ambossing roller that is made according to this invention.

10

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Here, the present invention will be explained in detail with reference to the accompanying drawings.

The manufacturing process of the ambossing roller according to this invention is thoroughly illustrated in Figure 1 .

The explanation of the manufacturing process is as follows.

Since the form of pattern of leather is different according to the part, one must first choose the natural leather part that is going to be used to create synthetic leather. The chosen original copy must be cleaned and sanitized then the silicone is mixed and put in a vacuum before it is applied onto the original copy. The reason the silicone mixture is put in a vacuum is because if the silicone mixture contains air bubbles the contact surface of the original copy and the silicone will produce a air bubble that will produce a unwanted design.

25

Generally, silicone will harden at 25degrees celcius in 24 hours, whereby after 24 hours when the silicone is completely hardened and the original is removed you will get a engraved silicone sheet.

Pour synthetic resin onto the engraved surface of the silicone sheet and let it harden. The synthetic resin here should also go through the process of being put in vacuum to remove the air bubbles. The synthetic resin used here should be one with a soft

30



characteristic like PVC or poliuretan and the thickness should be kept at 0.5- 2mm.

If the synthetic resin applied to the silicone hardens and becomes a synthetic resin sheet it should be removed from the silicone sheet. The removed synthetic resin sheet should have the same embossed carving as the original.

The synthetic resin sheet manufacturing process should be repeated and several embossed carving resin sheets with the same pattern and size should be produced and connected together. Before connecting the synthetic resin sheets, the sheets must go through a cutting process.

For the connected synthetic resin sheets to produce a mutual harmony as a whole the connecting edges of the synthetic resin must be cut so the pattern becomes sequential. Then the cut synthetic resin sheets must be stuck together by the touching surfaces. Like this if you connect several synthetic resin sheets the end outcome will be a synthetic resin sheet several times the size of the first original.

Again apply vacuum treated silicone onto the surface of the large connected synthetic resin sheet and let it harden. If the hardened silicone is removed from the synthetic resin sheet you will obtain a negative shaped silicone sheet several times larger than the initial silicone sheet.

In the above silicone sheet not only the pattern of the original copy will be obvious but also the connecting traces from the synthetic will be visible. The reason being that if silicone is applied to the synthetic resin sheet the silicone will make its way into the connecting parts of the synthetic resin thus these traces will be visible on the surface of the hardened silicone sheet.

Therefore after removing the silicone sheet from the synthetic resin sheet use the appropriate tools and chemicals to remove traces of the connections from the hardened silicone to obtain a clean negative shaped silicone sheet.

After this process you will have a negative shaped silicone sheet 120% larger than the embossing roller that you want to make, apply synthetic resin to the silicone sheet.

After the above synthetic resin is vulcanized and you remove  
5 it from the silicone sheet you will have a large synthetic resin sheet that has several connected patterns from the original copy but do not have the connecting traces.

The synthetic resin sheet produced here should be rolled to make a tube and then placed to fit inside a cylinder mold. The sheet  
10 must be rolled so that the pattern faces the inside and then the hems must be connected and placed exactly inside the cylinder mold. In this case the outer surface of the synthetic resin sheet and the inner surface of the mold must fit tightly so it does not turn loosely inside the cylinder mold.

15 In the above mold insert a iron rod and make sure the distance between the iron rod and the synthetic resin tube is 5-20mm. Then inject silicone into the space between the iron rod and the resin tube. In the above case the tighter the space is the cooling effect of the silicone becomes better thus creating better plasticity.

20 As shown in Figure 1 if caps are fitted onto the ends of the cylinder mold, and through the hole in the cap the axis of the iron rod can be fit in thus creating a uniform distance between the resin sheet and the rod. The caps also completely seal the cylinder mold.

Through the injection hole on one side of the cap vacuum  
25 treated silicone should injected in between the synthetic resin sheet and the iron rod. At the other end of the cap there is a ejection hole for the remaining air that is inside, thus the air will be pushed out by the silicone and this will prevent air bubbles from forming.

After the silicone is completely vulcanized inside the cylinder  
30 mold remove the mold and the synthetic resin tube and you will have a hardened embossing carved silicone applied to the outside of the iron rod, this is the embossing roller.

In the above silicone roller there will be traces of the connections of the synthetic resin tube using the appropriate tools and chemicals remove the marks completely you will then have a perfectly reproduced embossing carved silicone ambossing roller.

5       The above method is the most basic and decent method of this invention, and the products produced are not only limited to artificial leather but also include seats, film etc. made from thermoplastic synthetic resin and all products that bear surface patterns.

10       Explaining another part of this invention, the making of the master roller is as follows.

Take the final silicone ambossing roller made from the process and apply soft synthetic resin to the surface and let the resin harden completely.

15       After the vulcanization remove the tube formed synthetic resin applied to the silicone ambossing roller and turn it around so the negative shape outwards. Since the above synthetic resin tube does not have a connecting part it will not tear when turned outwards.

This synthetic resin tube is the master roller and if the  
20       silicone ambossing roller is no longer useable you can produce the same pattern ambossing roller through the master roller and use it again to produce products of the same pattern.

If we look at the process of reproducing a ambossing roller, we take the finished master roller turn the pattern inwards and insert  
25       it into a cylinder mold. The rest of the process is the same as injecting silicone into the mold and producing a ambossing roller.

If the master roll is used to produce many silicone rollers it enables one to reproduce the same pattern in mass quantities and to create a uniform quality and trustable product.

30       On the other hand here is another example of producing a silicone roller from a master roll.

First leave the master roll so the pattern faces outward and

put the roll onto an iron rod. Then turn the master roll and apply silicone and leave it to harden. Remove the hardened and negative shaped silicone and turn it outwards so the surface pattern faces outward and roll it into a tube. Take this silicone tube and insert it  
5 into a cylinder mold. Since the silicone tube is inserted this way the surface will come in contact with the inside of the mold. Then insert a iron rod into the mold. The distance between the silicone tube and the rod should be 5-20mm. Then inject silicone and let it harden. In this case the silicone is there just to attach the tube and the rod  
10 therefore it does not have to be injected in slowly. If the cylinder mold is removed the silicone tube will be attached to the iron rod and you will have a ambossing roller.

As in this case if you produce a master roll it will allow you to produce as many ambossing rollers whenever you want. It also  
15 reduces the cost and effort of reproducing the silicone roller.

A mater roll produced in the above method is made from soft synthetic resin and therefore when stored must be in the form of a master roller on an iron rod so it does not fold. However in this case there are spatial limits , and working with the roller would be  
20 difficult due to its weight. Therefore another example of this invention improves these weaknesses through a lighter master roll.

To produce a light master roll you must apply a vacuum treated silicone mixture to the surface of the original copy. Once the silicone hardens remove it from the original and you will have a  
25 negative shaped silicone sheet. Pour synthetic resin onto the imprint of the above silicone sheet and leave it to harden. The synthetic resin used here are vulcanizing synthetic resin like melamin, epoxy, vulcanized uretan etc. Once the above synthetic resin hardens, remove the synthetic resin from the silicone sheet and apply silicone  
30 onto the surface of the embossing carved synthetic resin and let it harden.

You will have a negative shaped silicone sheet. Repeat the

production process and make several engraved silicone sheets with the same pattern and size. Cut each silicone sheet so that the patterns fit together and attach the silicone sheets together. Like this by connecting several silicone sheets you can get a negative shaped  
5 silicone sheet several times larger than the original copy. Again apply vacuum treated vulcanizing synthetic resin to the surface of the connected silicone sheets and let it harden. If you remove the synthetic resin sheet from the silicone sheet, the surface of the synthetic resin sheet will not only contain the original pattern but  
10 also the connecting marks from the silicone sheet. Therefore after removing the synthetic resin sheet from the silicone sheet use the appropriate tools and chemicals to remove the connecting traces from the hardened synthetic resin sheet. After going through this process make a embossing carved synthetic resin sheet 120% larger than the  
15 master roll, apply silicone to the synthetic resin and let it harden. Remove the synthetic resin sheet from the silicone sheet and you will have a engraved silicone sheet with a sequence of the original pattern and no connecting traces left.

Take the silicone sheet and cut it so that it fits exactly into  
20 the cylinder mold and roll the sheet so that the pattern faces inward attach the hems and make a tube to fit it into the cylinder mold. Insert a iron rod and make sure the distance between the rod and the tube is approx. 5-10mm and then soft synthetic resin into the space between the rod and tube. As mentioned before put caps onto the  
25 ends of the mold, and through the injection hole inject vulcanized synthetic resin and through the ejection hole pump out the air.

Other than this you can also turn the cylinder and use the centrifugle force to produce a hardened synthetic resin master roll but that will be discribed later.

30 After the synthetic resin is completely hardened inside the cylinder mold remove the mold, the silicone tube and the iron rod and you will have a hardened embossing carved synthetic resin

master roll. On the surface of the master roll there will be traces of the silicone tube connecting parts, use adequate tools and chemicals to completely erase these marks so that you will have a pipe formed vulcanized synthetic resin master roll.

5       The pipe formed hardened synthetic resin master roll does not require a iron rod and is therefore easier to store and since it does not deform the original pattern can be kept almost indefinitely. To make a silicone roller from a hardened master roll is the same as is already mentioned.

10       As mentioned before the method of making a master roll using the centrifugal force is as follows. This method does not require rolling the silicone tube to face inwards and then inserting it with a iron rod into a cylinder mold , instead the mold with the silicone tube inside is turned and at the same time hardened synthetic resin is  
15 injected so that the resin will be applied equally due to the centrifugal force. This produces a pipe formed hardened master roll.

      The master roll production equipment as shown in Figure 2. The bracket(10) installed so that the cylinder mold(50) can turn, the motor(20) installed at the side of the bracket(10), the turning bar(30)  
20 connected to the turning axis of the motor(20), the roller(40) installed on the turning bar(30) touching the outer side of the cylinder mold(50) to transfer the turning of the motor(20) to the cylinder mold(50), the cap(70) installed at both ends of the cylinder mold (50) to prevent the synthetic resin injected into the cylinder mold(50) from  
25 leaking out. This is the structure of the master roll production equipment.

      The above motor(20) uses a changeable speed motor(20) so that when the applied hardened synthetic resin(60) reacts sensitively to the temperature inside the cylinder mold(50), the turning speed of  
30 the cylinder mold(50) can be changed.

      Thus if the temperature increases and the adhesive rate falls the motor speed should be increased and if the temperature falls and

the adhesive rate rises the motor speed should be decreased.

Install a cylinder mold in the above mentioned master roll production equipment and inject a mixture of hardened synthetic resin and start the motor. The turning of the motor is transferred to the cylinder through the rod and the roller installed on the rod. Therefore the synthetic resin will be applied onto the negative shaped silicone tube through the centrifugal force caused by the turning of the mold and it will slowly harden. After the resin is completely hardened remove the cylinder mold and the silicone tube and you will have a hardened synthetic resin master roll. The master roll will have connecting marks from the silicone tube, use adequate tools and chemicals to completely remove the marks and you will have a pipe shaped hardened synthetic resin master roll.

On the one hand because silicone does not have adhesiveness the shape of the iron rod used is very important when making a ambossing roller the reason being that if the surface of the silicone and the iron rod do not attach completely they will come apart when the roller is pressurized and the product will become a defect.

And therefore the characteristic of this invention is the installing of a silicone adhesive material on the surface of the iron rod.

As shown in Figure 3 the structure is to install steel nails (90) on the outer surface of the iron rod (80). The steel nails are supposed to pierce into the silicone and since the silicone is approx. 5-20mm thick the diameter of the nails should be 4-8 mm and the distance between nails should be 10-40mm. Since the silicone applied will flow between the nails the silicone will be fastened tight.

In another example of this invention, the adhesive material can be supplemented by a wire net or a sheet blanked holes on the surface. In the case of wire the empty space should be approx. 2-50mm or more and no less. The reason is that if the space is too small air bubbles can form when the silicone is injected, and if it is too big

the silicone in that part can fall off causing a defect.

In the case of cloth first you apply a adhesive agent and then stick the cloth onto the rod . The cloth used here should be 0.5-2mm and the adhesive agent should be let to dry fully.

5        Like this applying different kinds of adhesive materials to the surface of the iron rod prevent the silicone from coming loose when applied to the surface of the iron rod.

As explained above according to this invention before producing the ambossing roller it check the pattern and the surface  
10 state beforehand so that connecting marks do not remain, and also using the master roll it is possible to make several ambossing rollers allowing the mass manufacturing of products. Not only that by increasing the attachment between the iron rod and the silicone it reduces the chance of the silicone cming loose thus preventing the  
15 decline in the quality of products. While the present invention has been particularly shown and described with reference to particular embodiment thereof, it will be understood by those skilled in the art that various changes in form and details may be effected therein without departing from the spirit and scope of the invention as  
20 defined by the appended claims.



WHAT IS CLAIMED IS:

1. A method of manufacturing a ambossing roller, comprising the steps of:

Applying vacuum treated mixture of silicone on the original  
5 copy and after it hardens removing the silicone and getting a negative shaped silicone sheet;

Applying a soft vacuum treated synthetic resin to the negative surface of the silicone, and after it hardens removing the silicone sheet and getting a embossing carved synthetic resin sheet;

10 making several synthetic resin sheets and cutting them to fit each pattern and then connecting them together;

Applying vacuum treated silicone to the surface of the synthetic resin sheet and after it hardens removing the synthetic resin sheet and getting a large negative shaped silicone sheet;

15 Removing the connecting traces left from the large silicone sheet with adequate tools and chemicals and producing a negative shaped silicone sheet without any marks;

Applying synthetic resin on the silicone sheet and after it hardens removing the silicone sheet and getting a synthetic resin  
20 sheet with sequential patterns and no connecting traces;

Cutting the synthetic resin sheet so it will fit the cylinder mold precisely and then rolling the sheet so the pattern faces inward into a tube and attaching the hems. Then insert the tube into the mold and put the iron rod into the mold . Then pour silicone between  
25 the synthetic resin and iron rod;

Removing the cylinder mold after the silicone hardens and the synthetic resin tube on the outside of the iron rod will be a negative shaped and hardened silicone ambossing roller;

Removing the connecting marks on the silicone ambossing  
30 roller using suitable tools and chemicals

2. The method of claim 1, wherein the synthetic resin is selected from soft synthetic resins such as PVC or polyurethane.

3. The method of claim 1, wherein the step of cutting is that in order for the pattern of several synthetic resin sheets to fit together, cut the sheets according to the connecting surfaces and connect the sheets together.

5       4. The method of claim 1, where in the step of pouring silicone between the synthetic resin and iron rod is that the caps were placed on the ends and a iron rod was fit into the hole of the cap. And through one end of the cap, the injection hole, vacuum treated silicone was injected and through the other ejection hole air  
10 was sucked out so that the silicone would fill up completely.

5. A method of manufacturing a master roller, comprising the steps of:

applying soft synthetic resin to the surface of the finished silicone ambossing roller, letting the resin harden, removing the  
15 hardened embossing carved synthetic resin and turning it outwards so that the pattern faces outward.

6. A method of manufacturing an ambossing roller from a master roller, comprising the steps of:

Turning inside out the master roll produced by claim 5 so that  
20 the pattern faces inward, inserting the roll into a cylinder mold and insert an iron rod, inject silicone between the master roll and iron rod. After the silicone hardens, removing the mold and the master roll which attached a negative shaped silicone ambossing roller on the iron rod.

25       7. A method of manufacturing an ambossing roller from a master roller, comprising the steps of:

Inserting the iron rod into the the master roll produced by claim 5, rotate the rod and then applying silicone to the surface of master roll and let it harden. Remove the silicone and turn it so the  
30 surface pattern faces outward in order to make a silicone tube. Insert the silicone tube into a cylinder mold and then insert a iron rod into a silicone tube(the distance between the iron rod and the silicone

must be 5-20mm), then insert silicone into the space between the rod and the tube, let it harden and remove the mold.

8. A method of manufacturing an hardened master roller, comprising the steps of:

5       Applying vacuum treated mixture of silicone to the surface of the original copy, let it harden then remove the silicone to get a silicone sheet;

      Applying vacuum treated synthetic resin to the surface of the silicone sheet and let it harden, remove the silicone and you will have  
10   a embossing carved synthetic resin sheet;

      Applying silicone to the above synthetic resin sheet let it harden and remove to get a negative shaped silicone sheet;

      Making several sheets of silicone through the above process and cut it according to the pattern and attach the sheets to form a  
15   large silicone sheet;

      Applying vacuum treated vulcanized synthetic resin to the above silicone sheet and let it harden then remove the silicone and you will have a large vulcanized synthetic resin sheet;

      Removing the connecting marks left on the above synthetic  
20   resin sheet using the appropriate tools and chemicals so as to get a embossing crved synthetic resin sheet without connecting marks;

      Applying silicone to the synthetic resin sheet, let it harden and remove the silicone in order to get a sequential pattern embossing carved silicone sheet without connecting marks;

25       Cutting the above silicone sheet so it will fit the cylinder mold and roll the sheet into a tube so the pattern faces the inside attach the hems and insert the tube into the mold. Insert an iron rod that has a distance of 5-10mm from the silicone sheet. Inject hardened synthetic resin between the rod and the silicone;

30       Removing the mold and iron rod in order to get a pipe shaped vulcanized synthetic resin tube;

      Removing the connecting marks left on the synthetic resin

tube using the proper tools and chemicals.

9. The method of claim 8, wherein the step of injecting hardened synthetic resin between the rod and the silicone, comprising;

5 rotating the cylinder mold, pouring the hardened synthetic resin onto the surface of rotating silicone tube so as to the resin applied equally to the silicone tube due to the centrifugal force.

10. A equipment for manufacturing a master roller, comprising;

A bracket(10) that is installed so the mold can rotate, a  
10 motor(20) installed on the side of the bracket(10), a rotating bar(30) that is connected to the rotating axis of the motor(20), a roller(40) that is installed on the side of the rotating bar(30) that touches the cylinder mold(50) that transfers the rotations of the motor(20) to the cylinder mold(50), a caps(70) installed on the ends of the cylinder  
15 mold(50) to prevent the outflow of synthetic resin(60) that is injected into the cylinder mold(50).

11. The method of claim 1,4,7 or 8, wherein the iron rod is attached a silicone adhesive material on its surface so the silicone does not come off.

20 12. The method of claim 11, wherein the silicone adhesive material comprises several steel nails(90) which attached lengthwise to the surface of the iron rod(80).

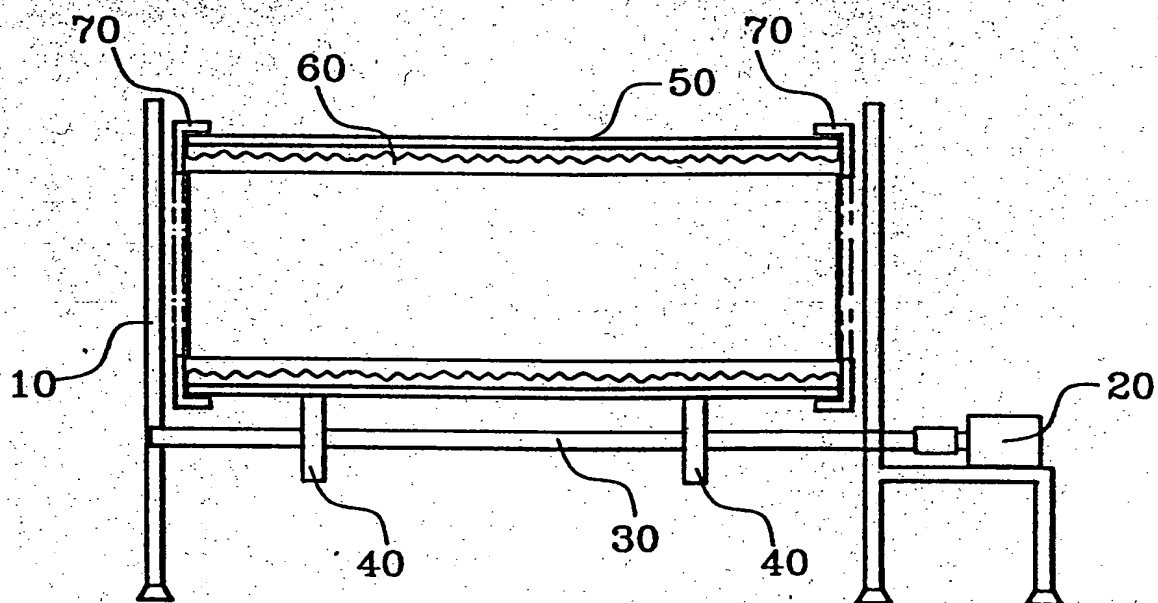
13. The method of claim 11, wherein the silicone adhesive material comprises a wire net or a sheet blanked holes on the  
25 surface.

14. The method of claim 11, wherein the silicone adhesive material comprises a fabric.



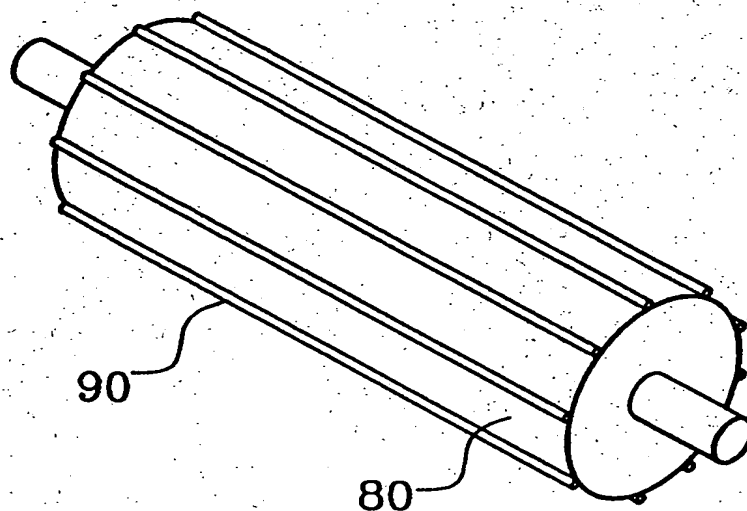
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FIG. 2



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FIG.3



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